FIX-N-FAX #58

CALIFORNIA DEPARTMENT OF FORESTRY
AND FIRE PROTECTION

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Pump Test Pit Design Recommendation

This information is published as a minimum General Guide. When planning/selecting a Design, you should anticipate all future growth possibilities.

- Increases in apparatus pump capacities
  (1500 GPM pumps and over, need two (2) inlets).

- Increases in numbers of apparatus to be tested
  (requiring less setup time).

- Environmental considerations
  (neighbors, noise, parking, etc.).

Most truck manufacturers and some fire departments have on-site closed test pits. If the test pit is poorly designed, problems may develop. High water temperature, water turbulence and aerating the water are your enemies; all of these conditions, separately or in combination, will cause a pump to prematurely cavitate. The exact combination of conditions can vary from morning to afternoon and from pump to pump, but the problems still come down to poor pit design. Typically, a pump affected by the pit conditions will pump 250 to 500 GPM below its maximum design capacity, so a 2000 GPM design pump running a 1500 GPM test may pass but a 1750 GPM design pump most likely will not pass a 1500 GPM test.

Some guidelines for designing a pit follow, but remember adjustment of internal baffles and hood design may be required to achieve the optimum results.

Controlling Water Temperature

The NFPA used 60◦F water temperature for ratings; 80◦F is still workable unless it is coupled with turbulence and/or aeration. When you reach 100◦F you will be in trouble. The best way to control water temperature rise is to have sufficient pit water capacity. Temperature rise is caused by the energy expended to pump the water, friction and truck heat exchanger functioning. The following is a list of tank size and capacity guidelines:

1) You should have a minimum of 10 gallons of usable water in the pit for each GPM of pump capacity.

   Example: 2000 GPM pump x 10 gallons of pit water = 20,000 gallons total usable pit water capacity minimum.

Note: Pumps are available up to 3000 GPM, and will you test two or more trucks at a time?

2) Pit depth should be between 13 and 15 feet.

3) Pit length should be 2-1/2 to 3 times the width.

4) Very high usage pits in hot climates may require more water capacity or a cooling tower. Bigger is better when it comes to pit capacity.

5) Greater pit capacity can help reduce the effects of turbulence or aeration.

Controlling Water Turbulence

Turbulence is caused by rapid uncontrolled water movement. To control/suppress/slow this water movement, baffles and partitions are needed. The following is a list of guidelines for partitioning and baffling the pit, starting from discharge end going to suction end:

1) Discharge water inlet.

2) Removable baffle, running full width, open six inches down from top of pit and open 24 inches up from the bottom of the pit. This baffle is at 1/4 distance of the tank length.

3) Optional baffle (removable) may be required between baffle in #2 and partition in #4.

4) A solid partition, full width, open 12 inches down from top pit and running to tank bottom. The top of this partition should have a curved radius edge toward the suction side of the pit — this is a weir design; at the top of the partition, lying at a 45 degree angle should be a metal or plastic screen with access plate over them for cleaning. This screen is full height and width and tilts toward the suction side of the pit. This partition is at 2/3 distance of the tank length.

5) Removable baffle, running full width, open at top three to four inches down and open 36 inches up from the bottom of the pit. This baffle is approximately 6 to 8 inches away from the solid partition of the suction side of the pit.

6) Suction end of pit.

7) Water depth on suction end must be sufficient to have three feet of water above the end of the suction hose.

Controlling Pit Water Aeration

Pit water aeration is caused by direct discharge stream injection into the pit reservoir and pit water surface turbulence it causes. Aerating the pit water is partly controlled by baffling and partitioning along with the screen wier design. The remaining control can be accomplished by using a hood with a curved back plate to direct discharge water flow. This hood must be at least two feet wide with a flat top as high as needed.

This hood may be full width of the pit and may be steel, thick aluminum, or concrete with a steel back plate.

Additional Pit Features:

1) Provide access to clean screen at weir.

2) A manhole cover access must be provided into both ends of pit.

3) Built-in ladders in pit at manhole covers is a good idea.

4) The two baffles should be removable; wood planks work well.

5) You will need a suction hose access opening with cover and handrail guards.

6) Discharge hood opening needs hinged cover plates.

7) Pit will need to be drained, depending on use, for cleaning, servicing, or modification. A sump in each chamber will allow you to pump out pit more completely or if the water table and sewer system allows, drain lines.

8) Provisions will be required to hold discharge test nozzles or flowmeters.

9) You will need the ability to read water depth in each chamber.

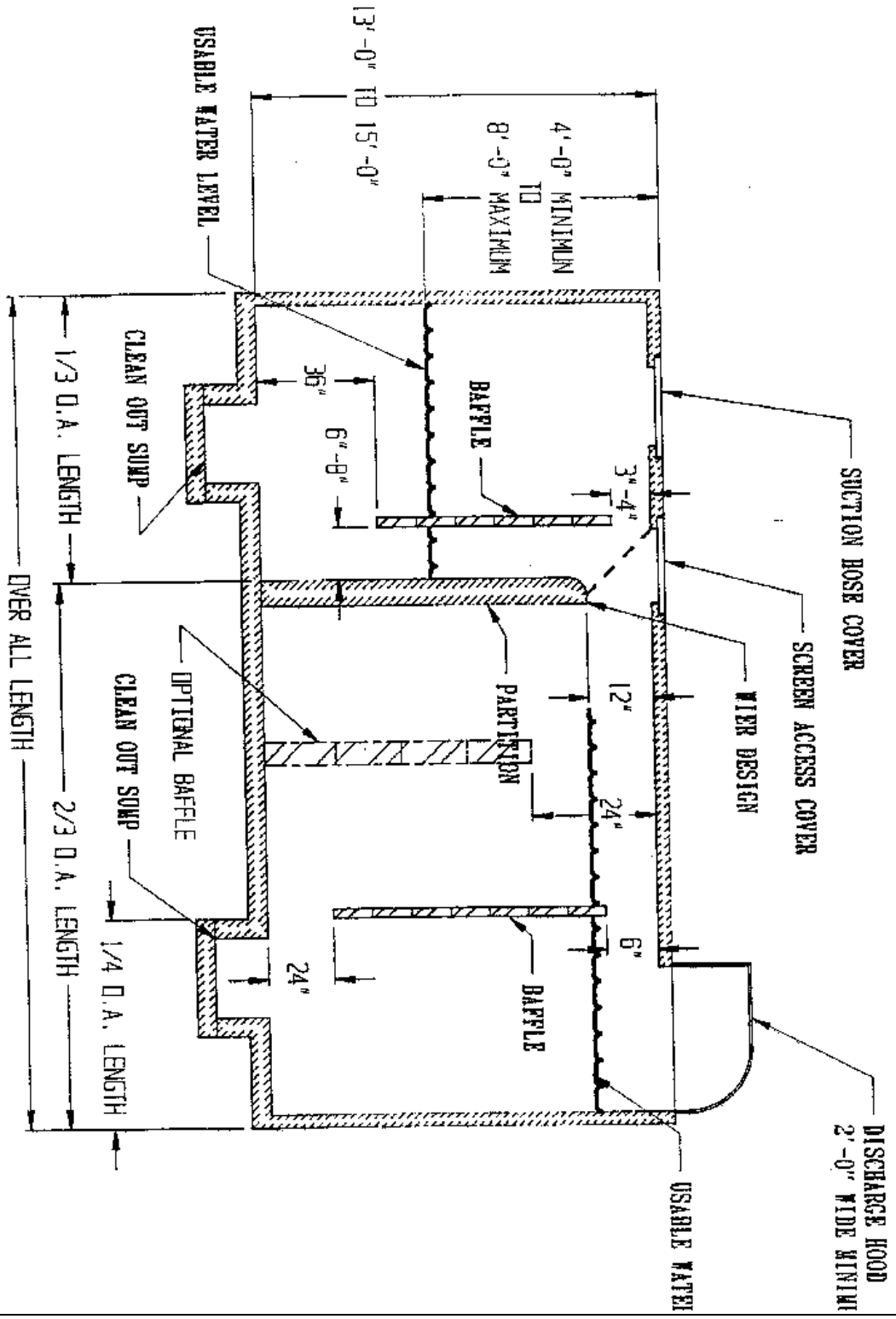
10) Water temperature will need to be checked and monitored.

11) Suction hose hookup to truck must maintain a downward slope for its entire length. No humps in hose hookup is the goal; air traps will not be acceptable.

12) A flat, level apparatus pad is required; apparatus parked at an angle may cause an air trap which will not be acceptable.

References

This article contains information from a variety of sources, including the test pit recommendations from the National Board of Fire Underwriters.



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